# Flip Chip Assembly Supply Chain

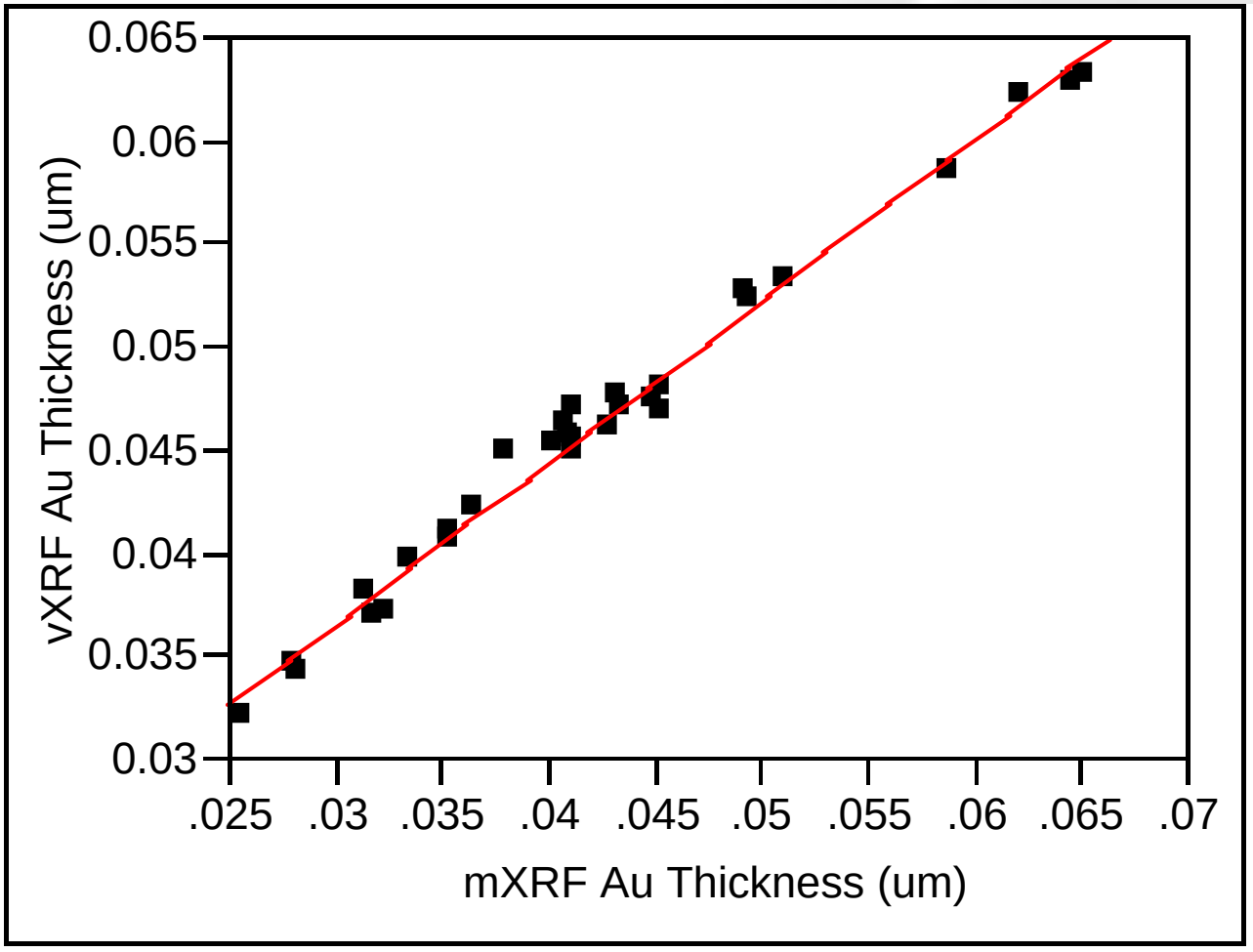
# Semiconductor Assembly

- Simple Process Flow
- Dynamic processes, small process windows
  - High sensitivity to second order factors, surface chemistry, friction, density, CoE, etc.
  - Product by product optimization required
- Massive Volume
  - Multiple Assembly sites building same product
  - Multiple suppliers shipping to multiple sites
  - Expectation of fully interchangable assembly

# Correlation Requirement

- Beyond establishing Accuracy, Capability and Stability every supplier must correlate each measurement parameter with Intel
- 30+ parts are measured at the supplier and Intel and evaluated statistically
- Process reveals any method divergence, fixturing variance, or ‘creative’ capability analysis
- ~30% reveals issues
- <10% if equipment is matched

# Thin Au/Ni Correlation vXRF vs. mXRF




vXRF Au Thickness (um) = 0.0129527 + 0.7844854 mXRF Au Thickness (um)

Linear Fit

# Interoperability

- Best opportunity for benefit to Intel is with controller interface standard
  - Allows us to select metrology best suited to application
  - Pricing is interesting question
    - Current pricing model may not work for users
    - Nobody wins if vendors don't benefit
- Very little leverage gained from existing standards
  - Mostly limited by lack of high level programming capability

# More than CMMs

- Contact CMM <10% of metrology activity
- Optical CMM
- Profiling Systems
- XRF
- Special Purpose tools

- It's important to recognize that Contact CMMs are the most stable metrology platform in this list
  - Can interoperability standards coexist with rapidly changing platforms?

# Concluding Remarks

- A document may not go far enough
  - Consider publishing reference code under an open license
  - Lower the bar for implementation
- Not paying sufficient attention to IP issues
  - 1 patent in the wrong hands could put this whole process to waste
  - Trademarks offer effective and impartial mechanism to fund activities